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## EUROPEAN PATENT APPLICATION

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### (54) Plastic granule automatic conveyance device

(57) The invention is a new device for the automatic conveyance of plastic granules, comprising two vertical rectangular plates facing each other and moving on their vertical plane, provided with several cylindrical openings connected by means of ducts to the plastic granule storage silos and to the moulding units, with an interposed pneumatic shutter. The central shutter mainly comprises an external cylinder, inside which two internal cylinders with ring-shaped ridges and O-rings run coaxially.

ially. The compressed air sent into special connections of the external cylinder causes the outward or inward movement of the internal cylinders until they insert in or detach from the openings of the plates aligned with the shutter. An electronic control and command circuit, connected to the new device and to the moulding units, determines what ducts of the plates must be connected and consequently controls the movements of the plates and of the shutter.

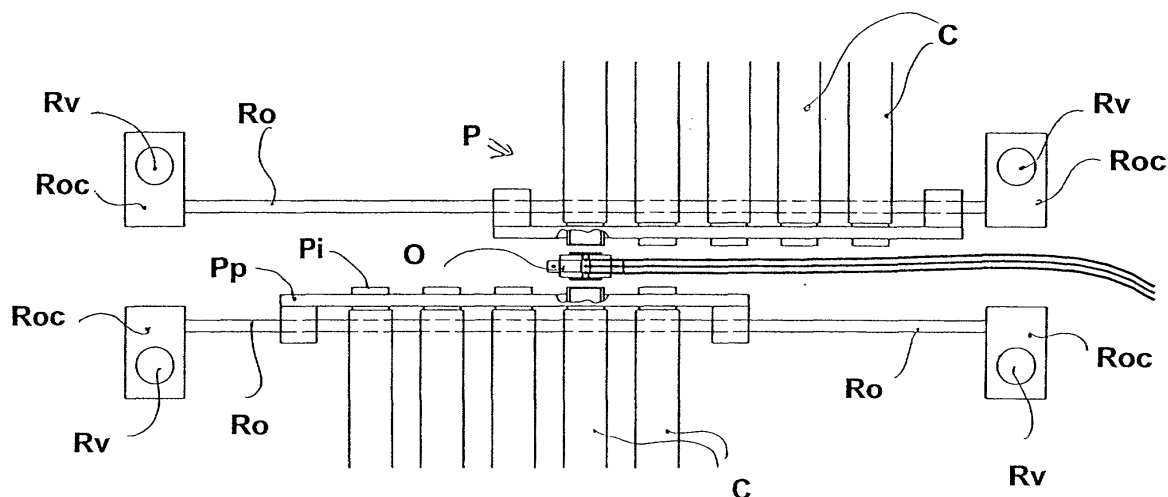


Fig. 1

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## Description

### FIELD OF THE INVENTION

[0001] The present invention concerns a machine for the production of plastic objects by the moulding of granules and in particular it concerns a new device for the conveyance of plastic granules from various deposits containing different granules to various moulding units.

### STATE OF THE ART

[0002] In the industry for the production of plastic objects there is the problem of having to produce various objects with different plastic materials and/or in different colours.

[0003] The plastic granules are held in silos from which they are conveyed to the moulding units through ducts.

[0004] At present an operator must manually connect the different ducts with the suction pump, which performs the pneumatic transport of the granules to the moulding units. This means that the time necessary to change type or colour of plastic is considerable and there is the risk of taking the wrong duct or of connecting the ducts badly, with resulting infiltration of air and therefore a lower flow of plastic granules.

[0005] There are devices for conveying plastic granules that comprise a horizontal row of openings, to which the various ducts arriving from the various silos are connected, and one opening, connected to the moulding unit, which moves above the row of openings and can be coupled with them. This device allows different types of plastic granules to be conveyed towards a single moulding unit.

[0006] There are devices for conveying plastic granules that comprise a vertical fixed wheel provided with openings arranged in a circle, to which the various ducts arriving from the various silos are connected, and one opening, connected to the moulding unit, mounted on a disc rotating parallel to the disc with the various openings.

### DESCRIPTION

[0007] The object of this patent is a new device for the automatic conveyance of plastic granules from various storage silos to various moulding units.

[0008] The aim of the new device is to convey the plastic granules arriving from the various silos to the respective moulding units.

[0009] Another aim of the new device is to allow plastic granules to be suitably conveyed without any of them remaining in the ducts and in the common conveying parts.

[0010] A further aim of the new device is to allow the conveyance of the plastic granules from a large number of drawing ducts to a large number of delivery ducts in

a reduced space.

[0011] Plastic granule automatic conveyance device comprising two vertical rectangular plates facing each other and moving laterally and vertically on their vertical plane, with an interposed pneumatic shutter.

[0012] Each plate has several cylindrical openings connected, on the non-exposed side of the plate, to as many ducts that in turn are connected to plastic granule storage silos or to moulding units.

[0013] The central shutter is composed of a horizontal main cylinder, with axis perpendicular to the two plates, and two cylinders sliding inside the main cylinder. The two internal sliding cylinders are moved towards the outside and towards the inside of the main cylinder by compressed air, so that they couple with the openings on the plates.

[0014] The characteristics of the new automatic device for conveying plastic granule from various storage silos to various moulding units will be better explained by the following description with reference to the drawings enclosed as an example without limitation.

[0015] Figure 1 shows a top view of the new device comprising, in its main parts, two plates facing each other (P) and a central shutter (O).

[0016] Each plate (P) comprises a vertical panel (Pp) to which cylindrical openings (Pi) passing through the panel (Pp) are fixed.

[0017] The end of each opening (Pi) opposite the other plate (P) is connected to a suitable duct (C) connected to a silo (S) containing plastic granules.

[0018] The openings (Pi) of each plate (P) may be arranged in various ways on the panel (Pp) itself, preferably organised in several rows having the same number of openings.

[0019] Each of the two plates (P) slides on two or more horizontal guides or rails (Ro) parallel to the panel (Pp), in such a way as to obtain the horizontal movement of the plate (P).

[0020] The ends of said horizontal guides or rails (Ro) are joined to suitable cursors (Roc) sliding on columns or vertical guides (Rv), in such a way as to obtain the vertical movement of the plates (P) and of the horizontal guides or rails (Ro).

[0021] Suitable mechanisms, for example electric motors or pneumatic pistons (not shown in the figure), carry out the horizontal movement of the plate (P) on the horizontal guides or rails (Ro) and the movement of the plate (P) and of the horizontal guides or rails (Ro) on the columns or vertical guides (Rv).

[0022] The combined horizontal and vertical movements of the plate (P) allow any opening (Pi) of the plate (P) itself to be aligned with the shutter (O).

[0023] Said shutter (O) is placed in a central position with respect to the two plates (P).

[0024] Figures 2 and 3 represent partially sectional side views of the various separate parts of the pneumatic shutter (O) and of the assembled pneumatic shutter (O), respectively.

**[0025]** The pneumatic shutter (O) mainly comprises an external cylinder (Oe) inside which two internal cylinders (Oi1, Oi2) with various sealing rings (Oa) and O-rings (Og) run coaxially.

**[0026]** On the external surface of the external cylinder (Oe) there are three connections (Oea), that is, three threaded holes, aligned parallel with the axis of the external cylinder (Oe) itself. These three connections (Oea) communicate with the inside of the external cylinder (Oe) and are then connected to as many compressed air ducts.

**[0027]** The internal cylinders (Oi1, Oi2) are composed of concentric cylinders positioned one (Oi1) inside the other (Oi2), sliding coaxially with each other and inside the external cylinder (Oe).

**[0028]** On the external surface of each of the two internal cylinders (Oi1, Oi2) there is a ring-shaped ridge (Oi1r, Oi2r). In particular, the internal cylinder (Oi2) with a smaller diameter (the innermost one) presents said ring-shaped ridge (Oi2r) indicatively half-way along its length, while the internal cylinder (Oi1) with a larger diameter presents said ring-shaped ridge (Oi1r) on its edge further inside the external cylinder (Oe).

**[0029]** Each internal cylinder (Oi1, Oi2) also presents one or more through holes (Oi1f, Oi2f) in correspondence with the corner between its ridge (Oi1r, Oi2r) and its external surface facing the outside of the external cylinder (Oe).

**[0030]** Two rings (Oa) applied to the ends of the external cylinder (Oe) limit the outward travel of the internal cylinders (Oi1, Oi2).

**[0031]** The ridges (Oi1r, Oi2r) of the internal cylinders (Oi1, Oi2) are such that, when said internal cylinders (Oi1, Oi2) have moved towards the outside of the external cylinder (Oe), each of the outermost connections (Oeae) of the external cylinder communicates with the chamber formed by the external surface of the internal cylinders (Oi1, Oi2), the internal surface of the external cylinder (Oe), the ridges (Oi1r, Oi2r) of the internal cylinders (Oi1, Oi2) and the rings (Oa) at the end of the external cylinder (Oe). On the other hand, the central connection (Oeac) communicates with the chamber formed by the two ridges (Oi1r, Oi2r), the external surface of the internal cylinders (Oi1, Oi2) and the internal surface of the external cylinder (Oe).

**[0032]** On the outside edges of the ridges (Oi1r, Oi2r), on the inside edges of the rings (Oa) at the ends of the external cylinder (Oe), on all the sliding surfaces and on the outside edges of the internal cylinders (Oi1, Oi2) there are O-rings (Og).

**[0033]** When compressed air is sent into the ducts for the outermost connections (Oeae), it acts on the ridges (Oi1r, Oi2r) of the internal cylinders (Oi1, Oi2), pushing said internal cylinders (Oi1, Oi2) towards the inside of the external cylinder (Oe); when the internal cylinders (Oi1, Oi2) have reached the innermost position in the external cylinder (Oe), part of the air flows out of the through holes (Oi1f, Oi2f) present in the internal cylinders

(Oi1, Oi2).

**[0034]** Vice versa, when compressed air is sent into the duct for the central connection (Oeac), the ridges (Oi1r, Oi2r) of the internal cylinders (Oi1, Oi2), and the cylinders (Oi1, Oi2) themselves are pushed towards the outside of the external cylinder (Oe).

**[0035]** The movements of the plates (P) and the activation of the shutter (O) are controlled by a special electronic circuit (E).

**[0036]** Figure 4 illustrates the use of the new conveyance device (D) connected, by means of ducts (C), to the silos (S) containing the plastic granules, to the moulding units (U) and to the electronic control circuit (E).

**[0037]** The operation of the new device for the automatic conveyance of plastic granules from various storage silos (S) to various moulding units (U) composed as in the above description may be summed up as follows:

- 20 - when a moulding unit (U) requires plastic granules of a given type, the electronic circuit (E) determines what duct corresponds to the silo (S) containing the necessary granules and what duct corresponds to the moulding unit (U) that needs these granules;
- 25 - the electronic circuit (E) activates the mechanisms for moving the two plates (P) so that the opening (Pi) for the moulding unit (U) and the opening (Pi) for the silo (S) containing the granules are exactly aligned with the shutter (O);
- 30 - the electronic circuit (E) gives the command to send compressed air into the duct for the central connection (Oeac) of the external cylinder (Oe) of the shutter (O), so as to move the internal cylinders (Oi1, Oi2) of the shutter (O) towards the outside;
- 35 - this movement brings the edge of said internal cylinders (Oi1, Oi2) in contact with the two openings (Pi) of the two plates (P), so that they are in communication;
- 40 - in this position the moulding unit (U) takes the granules from the silo (S), usually by vacuum; the granules pass through the openings (Pi) of the plates (P) and into the shutter (O);
- 45 - when the moulding unit (U) has finished taking the granules of plastic material, the electronic circuit (E) gives the command to send compressed air into the ducts for the external connections (Oeae) of the external cylinder (Oe) of the shutter (O), so as to move the internal cylinders (Oi1, Oi2) of the shutter (O) towards the inside;
- 50 - this movement substantially detaches the internal cylinders (Oi1, Oi2) from the openings (Pi) of the two plates (P); secondarily, owing to this movement the air sent into the shutter (O) penetrates inside the shutter (O), blowing out any granules that may have been left inside the shutter (O) itself;
- 55 - the cycle can start again immediately to connect two other openings (Pi) of the two plates (P).

**[0038]** The new device for the automatic conveyance of plastic granules from various storage silos (S) to various moulding units (U) composed as described above presents considerable advantages.

**[0039]** It is possible to connect a large number of silos (S) containing plastic granules with a large number of moulding units (U), thus allowing the production of articles with several types or colours of plastic material.

**[0040]** The size of the new device is very compact in comparison with the number of connections that can be obtained.

**[0041]** The plastic granules cannot remain in the common exchange areas (shutter) at the end of each moulding operation.

**[0042]** Therefore, with reference to the above description and to the enclosed drawings, the following claims are expressed.

## Claims

1. Plastic granule automatic conveyance device, **characterised in that** it comprises two vertical rectangular plates (P) facing each other and moving on their vertical plane, with an interposed pneumatic shutter (O), and wherein each plate has several cylindrical openings (Pi) connected, on the non-exposed side of the plate, to as many ducts (C) that in turn are connected to plastic granule storage silos (S) or to moulding units.
2. Plastic granule automatic conveyance device according to claim 1, **characterised in that** the central shutter (O) is composed of several concentric cylinders (Oi1,Oi2), at least two of which move coaxially until they reach the openings of the two plates (P) aligned with said shutter (O).
3. Plastic granule automatic conveyance device according to claims 1, 2, **characterised in that** each plate slides on two or more horizontal guides or rails (Ro) parallel to the plate itself, and wherein the ends of said horizontal guides or rails are joined to suitable cursors (Roc) sliding on columns (Rv) or vertical guides, and wherein suitable mechanisms carry out the horizontal movement of the plate (P) on the horizontal rails or guides (Ro) and the movement of the plate (P) and of the horizontal rails or guides (Ro) on the columns or vertical guides (Rv).
4. Plastic granule automatic conveyance device according to claims 1, 2, 3, **characterised in that** the shutter (O) mainly comprises an external cylinder (Oe), with connections (Oea) for pneumatic ducts (C), inside which at least two internal cylinders (Oi1,Oi2) with ring-shaped ridges (Oi1r, Oi2r) and O-rings run coaxially, and wherein the connections of the external cylinder communicate with chambers formed by the external surface and by the ring-shaped ridges of the internal cylinders and by the inside wall of the external cylinder, and wherein the compressed air sent into one or more connections of the external cylinder (Oe) causes the outward or inward movement of the internal cylinders (Oi1,Oi2), and wherein the outward movement of the internal cylinders (Oi1,Oi2) causes them to insert in the openings (Pi) of the plates aligned with the shutter (P).
5. Plastic granule automatic conveyance device according to claims 1, 2, 3, 4, **characterised in that** the shutter (O) presents communication holes (Oi1f, Oi2f) between the pressure chambers for the movement of the internal cylinders (Oi1,Oi2) and the inside of the internal cylinders, and wherein said communication holes (Oi1f, Oi2f) are placed in positions such as to allow the passage of compressed air only when the internal cylinders have moved inside the shutter.
6. Plastic granule automatic conveyance device according to claims 1, 2, 3, 4, 5, **characterised in that** it is provided with an electronic circuit for the control and command of the various mechanisms of the conveyance device, and wherein said electronic control and command circuit determines what duct (C) corresponds to the silo (S) containing the necessary granules and what duct corresponds to the moulding unit (U) that needs these granules, activates the mechanisms for moving the two plates (P) so that the opening (Pi) for the moulding unit (U) and the opening (Pi) for the silo (S) containing the granules are exactly aligned with the shutter (O), gives the command to send compressed air into the suitable ducts of the shutter, so as to move the internal cylinders (Oi1,Oi2) towards the outside until said internal cylinders bring their edge in contact with the two openings (Pi) of the two plates, waits until the moulding unit has taken the granules from the silo, gives the command to send compressed air into the suitable ducts (Oeae) and (Oi1f,Oi2f), so as to move the internal cylinders (Oi1, Oi2) of the shutter (O) towards the inside and detach them from the openings (Pi) of the plates and clean the ducts.

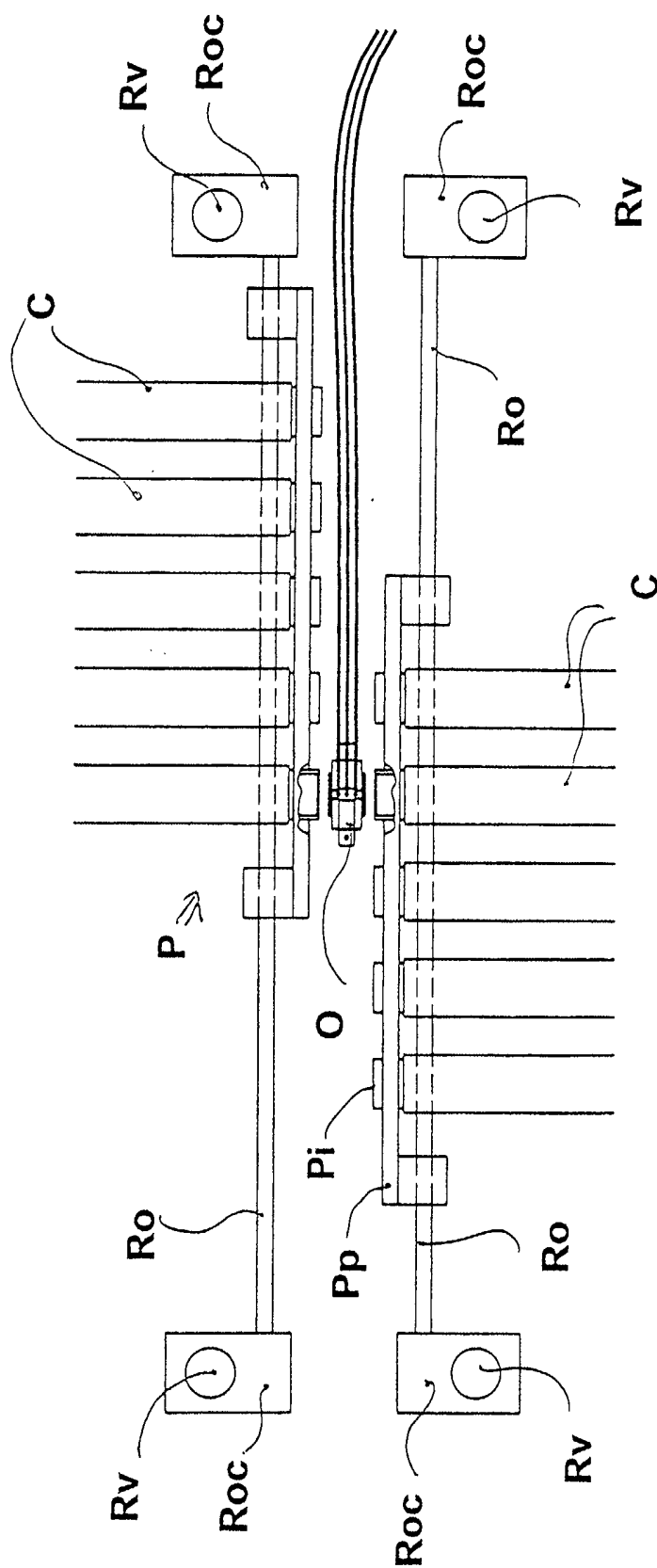
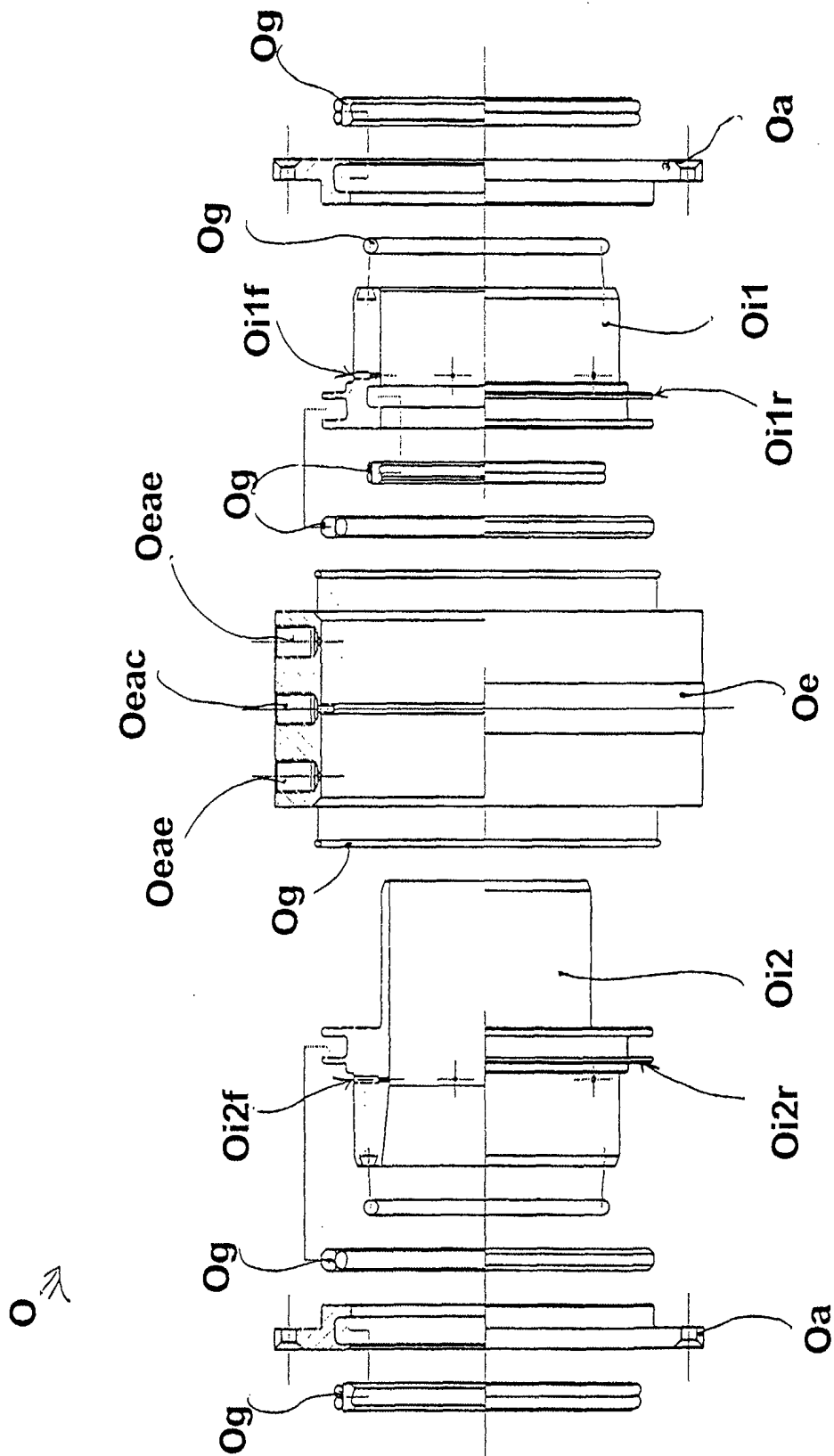


Fig. 1



**Fig. 2**

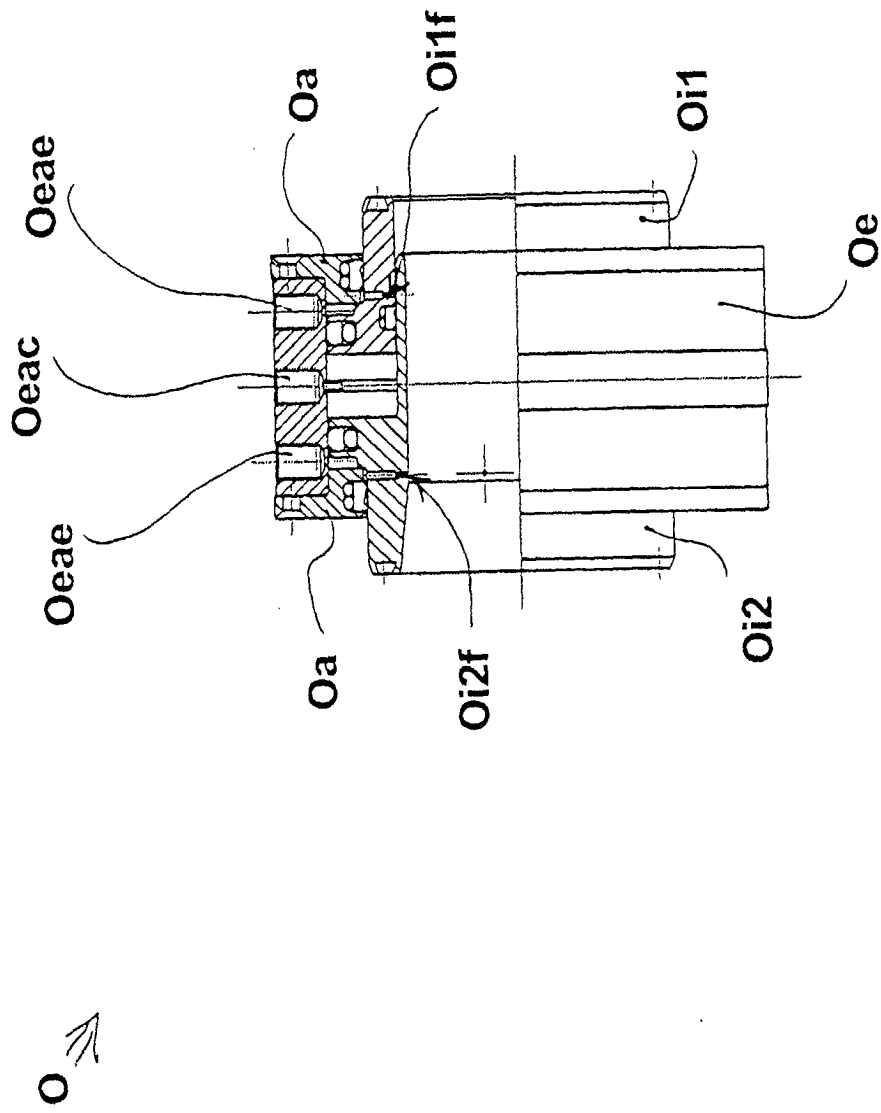


Fig. 3

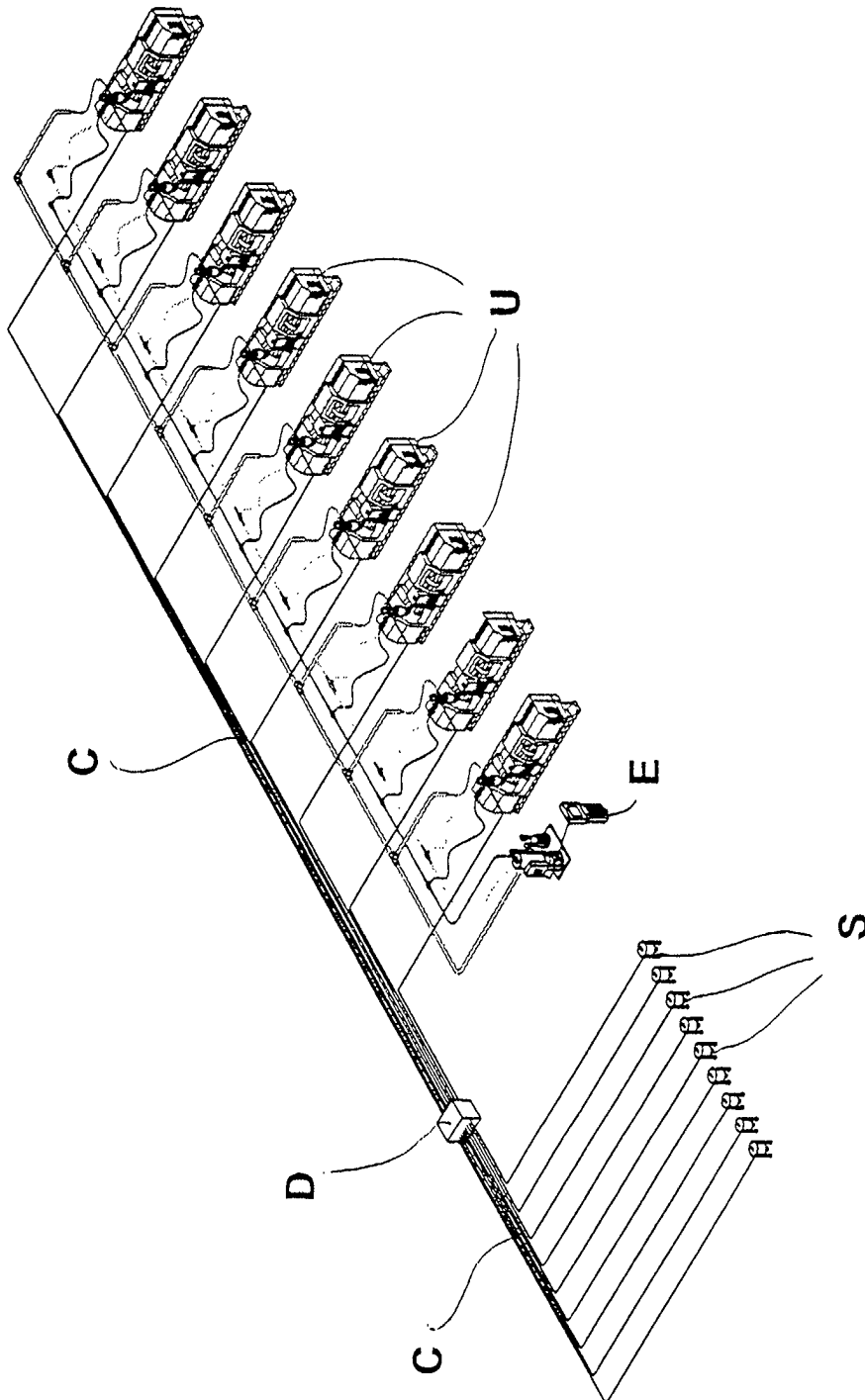


Fig. 4



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# EUROPEAN SEARCH REPORT

Application Number  
EP 02 01 6460

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The present search report has been drawn up for all claims			
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EPO FORM 1503 03/82 (P04C01)

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